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Abundance and Run Timing of Adult Salmon in Gisasa River, Koyukuk National Wildlife Refuge, Alaska, 2005

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John P. O'Brien

Abstract

During 2005, a resistance board weir was used to record escapement information for Chinook *Oncorhynchus tshawytscha* and chum salmon *O. keta* in the Gisasa River, a tributary of the Koyukuk River, Alaska. An estimated total of 3,111 Chinook salmon migrated through the weir. Five age groups were identified from 591 Chinook salmon sampled, with age 1.3 (57%) dominating. The sex ratio was 33% female and 67% male. The mean length for females was 760 mm, range 440-965 mm, and the mean length for males was 663 mm, range 420-890 mm. An estimated total of 172,259 chum salmon migrated through the weir. Two age groups were identified from 619 chum salmon sampled, with age 0.3 (98%) dominating. The sex ratio was 45% female and 55% male. The mean length for females was 547 mm, range 470-615 mm, and the mean length for males was 577 mm, range 445-655 mm. Sixty sockeye salmon *O. nerka* were also counted as they passed through the weir. The most abundant non-salmon species was northern pike *Esox lucius* (N=23) followed by Arctic grayling *Thymallus arcticus* (N=13) whitefish (Coregoninae; N=8), and longnose sucker *Catostomus catostomus* (N=8). Chinook and chum salmon escapement counts from this portion of the Koyukuk River drainage assist fisheries managers in making in-season decisions during the Yukon River commercial and subsistence fishing seasons, provide post-season evaluation of various management practices, and assist in developing future run projections.

Introduction

The Yukon River drainage, encompassing 854,700 km^2, is among the largest producers of wild Chinook *Oncorhynchus tshawytscha* and chum salmon *O. keta* stocks in North America (Daum and Osborne 1999). Chinook, chum, and coho salmon *O. kisutsh* use 1,931 km of the Yukon River and 675 km of the Koyukuk River for migration routes to spawning grounds (Buklis and Barton 1984; Bergstrom et al. 1995). The Yukon River is the only North American drainage that has two distinct runs of chum salmon, which are referred to as summer and fall runs (Vania et al. 2002). Genetic studies reported by Wilmot et al. (1992) showed that these two runs were genetically distinct and differed in life history and phenotypic characteristics, i.e. run timing, spawning locations, and morphology. Chinook and summer chum salmon run timing in the Yukon River starts in late May and continues through mid-July (Wiswar 2000). Fall chum salmon run timing starts in late June and continues through early September (Vania et al. 2002). Chinook salmon spawn throughout the Yukon River drainage, whereas summer chum salmon spawn mainly in the lower and middle reaches (Minard 1996). Fall chum salmon spawn mainly in the upper portions of the Yukon River drainage.

Recent declines in Yukon River salmon runs, particularly summer and fall chum salmon have led to harvest restrictions, complete fishery closures, and spawning escapements below management

Author: John P. O'Brien is a fisheries technician with the U.S. Fish and Wildlife Service. The author can be contacted at the Fairbanks Fish and Wildlife Field Office, 101 12th Avenue, Room 110, Fairbanks, Alaska 99701; or John_O'Brien@fws.gov.

goals on many tributaries (Kruse 1998; Vania et al. 2002). The collection of accurate escapement estimates from these tributaries is required to determine exploitation rates and stock-recruit relationships (Labelle 1994), and to maintain genetic diversity and sustainable harvest (Vania et al. 2002). Management of the Yukon River fishery is complex due to the inability to determine specific stock abundance and run timing, overlapping of multi-species salmon runs, the increasing efficiency of the fishing fleet, allocation issues, and the immense size of the Yukon River drainage. In an attempt to understand this mixed-stock salmon fishery, several studies are being conducted along the main stem and tributaries of the Yukon River to provide managers with information required to assess in-season Chinook and chum salmon escapements (Vania and Golembeski 2000).

In accordance with the Alaska National Interest Lands Conservation Act of 1980, the U.S. Fish and Wildlife Service (USFWS) is obligated to conserve the natural diversity of fish and wildlife resources on National Wildlife Refuge lands. Additional USFWS goals are to conserve fish and wildlife populations, maintain habitats in their natural diversity, and provide the opportunity for continued subsistence use by local residents (USFWS 1993). In the Koyukuk River drainage (a middle Yukon River tributary), Chinook and summer chum salmon (hereafter referred to as chum salmon) utilize tributaries that run through National Wildlife Refuge boundaries. The Koyukuk River originates in the Brooks Range, and the river flows southwesterly, passing through the Kanuti (Kanuti Refuge) and Koyukuk/Nowitna (Koyukuk Refuge) National Wildlife Refuges before entering the Yukon River, 818 km upriver from the mouth. The Kanuti Refuge is located on the upper Koyukuk River near the villages of Allakaket, Alatna, and Bettles. The Koyukuk Refuge is located on the lower Koyukuk River near the villages of Koyukuk, Galena, Huslia, and Hughes.

Historically, escapement information on salmon stocks from the Koyukuk River has been collected by aerial surveys. The Alaska Department of Fish and Game, Division of Commercial Fisheries (ADF&G-DCF) has conducted these surveys on several index tributaries within the Koyukuk River drainage intermittently since 1960 (Barton 1984). Unfortunately, aerial surveys are highly variable and only represent an index of instantaneous escapement. To record total escapements, aerial survey methods have been replaced with more accurate population assessment methods, such as counting towers, floating weirs, and hydroacoustics. To collect baseline information on salmon stocks in the Koyukuk River drainage, the U.S. Fish and Wildlife Service-Fairbanks Fish and Wildlife Field Office (USFWS-FFWFO) and Bureau of Land Management (BLM) have designed and operated stock status and escapement projects in five different Koyukuk River tributaries. Floating weirs have been operated by USFWS-FFWFO on the Gisasa River since 1994 (Melegari and Wiswar 1995), on Henshaw Creek since 2000 (Wiswar 2000), the South Fork of the Koyukuk River from 1996 to 1997 (Wiswar 1997, 1998a) and on the Kateel River in 2002 (VanHatten 2005). The weir study on the South Fork of the Koyukuk River was discontinued in 1997 due to persistent high water conditions. A counting tower was operated by the Tanana Chiefs Conference (TCC) and BLM on Clear Creek, a tributary of the Hogatza River, from 1995 to 2000 (VanHatten 1999). A standard picket weir was installed on Clear Creek in 2001 and is currently in operation (C. Kretsinger, Bureau of Land Management, Fairbanks, personal communication).

Historical data on Chinook and chum salmon in the Gisasa River include aerial survey counts collected from 1960 to 1998 (Barton 1984; Schultz et al. 1993; Vania et al. 2002; Appendix 1). Chinook salmon estimates from aerial surveys ranged from 45 fish in 1978 to 2,775 fish in 1994.

Chum salmon aerial survey estimates ranged from 0 fish in 1961 to 56,904 fish in 1975. Escapement estimates from a resistance board weir were collected from 1994 to 2005 (Melegari and Wiswar 1995; Melegari 1996, 1997; Wiswar 1998b, 1999, 2000, 2001; VanHatten 2002, 2004, 2005; O'Brien and Berkbigler 2005). Annual weir counts for Chinook salmon ranged from 1,774 fish in 2004 to 4,023 fish in 1995 (Appendix 1). Chum salmon weir escapements ranged from 10,155 fish in 1999 to 172,259 fish in 2005. This report describes the 2005 Gisasa River escapement project conducted by USFWS-FFWFO. The objectives of the 2005 study were to: 1) determine daily escapement and run timing of adult salmon; 2) determine sex and size composition of adult salmon; and 3) determine the presence and movement of resident fish.

Study Area

The Gisasa River is located 90 km upriver from the mouth of the Koyukuk River in the western interior of Alaska (Figure 1). The headwaters originate in the Nulato Hills and the river flows 112 km northeast, passing through the Koyukuk Refuge, before draining into the Koyukuk River (65^{o} 15.206' N latitude, 157^{o} 42.529' W longitude, USGS 1:63,360 series, Kateel River B-4 quadrangle). Climate conditions of the Koyukuk River drainage are characteristically continental with seasonal temperature variations and very low precipitation. The air temperature ranges from 18^{o} C during summer months to -57^{o} C during winter months (USFWS 1993). The hydrology of this area is very dynamic throughout the year with high water levels during spring and low water levels in summer.

The Gisasa River channel configuration is typically meandering with alternating cut banks and gravel bars. The substrate varies from gravel and cobble in high velocity areas to mud and silt in lower velocity areas. The lower river sections are characteristically more uniform in appearance with gradual sloping mud banks and emergent shoreline vegetation (USFWS 1993). The weir site is located approximately 4 km upriver from the mouth of the Gisasa River. This site was selected for its optimal width (76 m), depth (0.5 m), and substrate composition (medium size gravel 25-50 mm intermediate diameter).

Methods

Weir Construction

A resistance board weir was used to collect biological information from adult salmon as they migrated into the Gisasa River to spawn. The project start date was based on previous years' run timing data. The end date was determined in-season; when the daily count of each species dropped to less than 1% of the seasonal passage to date and continued at this low level for three or more consecutive days. The construction and installation of resistance board weirs was described by Tobin (1994). Each picket of the weir was made of schedule-40, polyvinyl chloride electrical conduit with 2.5 cm inside diameter and individual pickets spaced 3.2 cm apart, gap between pickets (Wiswar 2001). During daily visual inspection, the weir was cleaned of debris, fish carcasses, and gravel dislodged by spawning fish. A live trap installed near mid-channel allowed salmon and other fish species to be recorded as they passed through the weir.

Biological Data

Run timing and abundance of adult Chinook and chum salmon were estimated by recording and plotting the number of each species of fish passing through the weir each day. Because non-salmon species were not handled, it was difficult to identify different whitefish species; therefore all whitefish species were grouped under the subfamily Coregoninae.

The counting schedule was designed to count migrating fish species 24 hours a day, 7 days a week for the duration of the project. The daily counting schedule began at 0000 hours and ended at 2400 hours. The 24-hour counting period was divided into eight 3-hour periods, with crew members being assigned two specific periods. During time periods when biological sampling was conducted, an additional crew member would assist.

A stratified random sampling scheme was used to collect age, length, and sex ratio information from all salmon species. Sampling started at the beginning of each week and generally was conducted over a 3-4 day period, targeting 160 salmon /species /week. Scales were used for ageing salmon with age class information being reported using the European technique (Foerster 1968). Three scales were collected from Chinook salmon and one scale from chum salmon. Scales were sampled from the area located on the left side of the fish and two rows above the lateral line on a diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin. Scales samples from both adult salmon target species were sent to ADF&G-DCF for processing. Some scales could not be aged due to loss or deterioration. These were placed in a category called unknown age and data from these fish were not included in sample sizes or any age, sex or length calculations. Lengths of Chinook and chum salmon were measured to the nearest 5 mm from mid-eye to fork of the caudal fin (MEL). Sex ratio data were collected during age and length sampling. The sex of each fish was visually determined by secondary sex characteristics. Daily escapement counts and sex ratios were reported to USFWS-FFWFO in Fairbanks.

Spawning sockeye salmon *O. nerka* have been reported sporadically in the Gisasa River since the mid-1990's (J. Melegari, USFWS, personal communication). Efforts to document their presence in the drainage have been inconsistent. For the first time, cursory age, sex, and length data for sockeye were gathered in 2005. Fin-clips samples for genetic analysis of sockeye salmon, were also obtained. These data will be presented in a future report specific to Yukon River sockeye salmon.

Data Analysis

When daily counts were missed due to high water they were estimated by linear interpolation between the daily counts before and after the high water event. Incomplete 24h counts due to high water were adjusted for a 24h period. Historical annual weir estimates were revised in 2004 to account for missed daily counts and incomplete daily counts.

Calculations for age and sex information were treated as a stratified random sample (Cochran 1977) with statistical weeks as the strata. Each statistical week was defined as beginning on Wednesday and ending on Tuesday. However, weeks at the beginning and end of the run were combined to increase sample size. Within a week, the proportion of the samples composed of a given sex or age, $\hat{p}_{ij}$, were calculated as:

$$\hat{p}_{ij} = \frac{n_{ij}}{n_j},$$

where n_{ij} is the number of fish by sex *i* or age *i* sampled in week *j*, and n_j is the total number of fish sampled in week *j*. The variance of $\hat{p}_{ij}$ was calculated as:

$$\hat{v}(\hat{p}_{ij}) = \frac{\hat{p}_{ij}(1-\hat{p}_{ij})}{n_j - 1}.$$

Sex and age compositions for the total run of Chinook and chum salmon of a given sex/age, $\hat{p}_i$ were calculated as:

$$\hat{p}_i = \sum_{j-1} \hat{W}_j \hat{p}_{ij,}$$

where the stratum weight $\hat{W}_j$ was calculated as:

$$\hat{W}_j = \frac{N_j}{N},$$

and N_j equals the total number of fish of a given species passing through the weir during week j, and N is the total number of fish of a given species passing through the weir during the run. Variance, $\hat{v}(\hat{p}_i)$ of sex and age compositions for the run was calculated as:

$$\hat{v}(\hat{p}_i) = \sum_{j-1} \hat{W}_j^2 \hat{v}(\hat{p}_{ij}).$$

Results and Discussion

Weir Operations

In 2005, the Gisasa River weir operated from June 29 to July 31 (Table 1). The installation of the weir and start of operations were delayed in 2005 due to high water. High water conditions can submerge weir panels and allow fish to migrate past a weir undetected (Tobin 1994). When the weir was operational the picket spacing within the trap and weir panels was narrow enough to prevent adult Chinook and chum salmon from passing through the weir. However, some of the smaller fish species, such as Arctic grayling and whitefish, likely passed through the weir undetected.

Biological Data

A total of 3,111 Chinook salmon, 172,259 chum salmon, 60 sockeye salmon, and 52 non-salmon species were counted as they passed through the weir (Table 1). The most abundant non-salmon species was northern pike *Esox lucius* (N=23), followed in descending order by Arctic grayling *Thymallus arcticus* (N=13), longnose sucker *Catostomus catostomus* (N=8), and whitefish (Coregoninae; N=8). The delay in the start date of weir operation for 2005 allowed fish to migrate into the Gisasa River without being enumerated. The seasonal counts for 2005 should be viewed as conservative estimates of total escapement.

The first Chinook salmon was counted on June 29 and the last Chinook salmon was counted on July 31 (Table 1; Figure 2). The first quartile migrated through the weir by July 8, the median migration date was July 13, and the third quartile passed the weir on July 17 (Table 1; Figure 2). There were 612 Chinook salmon sampled for age composition with 21 (3%) of the samples classified as unknown (Table 2). Age composition of sampled Chinook salmon included five

age groups: age 1.5 (0.3%), age 1.4 (15%), age 2.3 (0.2%), age 1.3 (57%), and age 1.2 (27%). In general, Chinook salmon populations are made up of six different age classes, with six year-old fish (age 1.4) dominating (Groot and Margolis 1998). The 2005 seasonal Chinook salmon sex ratio was comprised of 33% females, representing a stratified seasonal estimate of 1,039 female fish (Table 2). In 2005, the Chinook salmon age distribution by sex was unevenly divided among the five age groups with age 1.3 dominating the females (56%) and the males (57%; Table 2). In 2005, the average female Chinook salmon length was 760 mm with a range from 440 to 965 mm (Table 3). The average male Chinook salmon length was 663 mm with a range from 420 to 890 mm.

The first chum salmon was counted on June 29 and the last chum salmon was counted on July 31 (Table 1; Figure 2). The first quartile migrated through the weir by July 8, the median migration date was July 14, and the third quartile passed the weir on July 18 (Table 1, Figure 2). There were 680 chum salmon sampled for age composition with 61 (9%) classified as unknown (Table 4). Age composition of sampled chum salmon consisted of two age groups: age 0.4 (2%) and age 0.3 (98%). In general, chum salmon are comprised of age 0.2, age 0.3, and age 0.4 fish, with four year-old fish (age 0.3) dominating (Groot and Margolis 1998). In 2005, female chum salmon comprised 45% of the run, representing a stratified seasonal estimate of 77,987 female fish (Table 4). The age distribution by sex was unevenly divided among the two age groups with age 0.3 chum salmon dominating both the females (99%) and males (98%; Table 4). The average female chum salmon length was 547 mm with a range from 470 to 615 mm (Table 3). The average male chum salmon length was 577 mm with a range from 445 to 655 mm.

The 2005 Chinook salmon escapement estimate (3,111 fish) was 121% of the 1995-2004 average of 2,568 fish (Figure 3; Appendix 1). The Gisasa River Chinook salmon escapement counts fluctuated between 1995 and 2005 (Figure 3). From 1995 to the present the Chinook salmon escapement counts ranged from 1,774 in 2004 to 4,023 in 1995. The general trend of increased Chinook salmon returns during odd-numbered years was apparent again in 2005. The 2005 chum salmon escapement (172,259 fish) was 355% of the 1995-2004 average of 48,542 fish (Figure 3; Appendix 1). The chum salmon counts have also undergone considerable fluctuation, ranging from 10,155 in 1999 to 172,259 in 2005. The low production cycle for chum salmon that began in 1997 and lasted for eight continuous years ended in 2005.

Conclusion

Due to the complexity of the Yukon River mixed-stock salmon fishery and the difficulty in managing specific stocks, it is essential to continue collecting information from individual salmon populations, including stocks in the Koyukuk River drainage. The three current enumeration projects in the drainage, Henshaw Creek, Clear Creek, and Gisasa River, provide valuable indices of salmon escapement and should be continued. These projects also provide information about population characteristics to monitor status and trends over time.

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Table 1. Daily and cumulative (Chinook and chum salmon only) counts of fish migrating through Gisasa River weir, Alaska, 2005. Cum = Cumulative. * indicate first, middle and third quartile of run.

	Chinook salmon		Chum salmon		Sockeye salmon	Arctic grayling	Longnose sucker	Whitefish spp.	Northern pike
	Daily	Cum	Daily	Cum	Daily	Daily	Daily	Daily	Daily
29-Jun	37	37	3,357	3,357	0	0	0	0	0
30-Jun	21	58	1,850	5,207	0	1	1	4	1
1-Jul	25	83	2,226	7,433	1	0	1	2	0
2-Jul	45	128	2,092	9,525	0	3	0	0	0
3-Jul	29	157	2,884	12,409	0	1	0	0	2
4-Jul	39	196	3,702	16,111	0	0	0	0	2
5-Jul	42	238	6,330	22,441	0	0	1	0	1
6-Jul	229	467	8,352	30,793	0	2	0	1	1
7-Jul	256	723	8,404	39,197	0	0	0	1	2
8-Jul	145	868*	6,564	45,761*	0	0	2	0	1
9-Jul	158	1,026	5,980	51,741	0	3	0	0	0
10-Jul	93	1,119	4,621	56,362	0	0	0	0	0
11-Jul	93	1,212	4,807	61,169	0	1	0	0	1
12-Jul	329	1,541	10,256	71,425	0	0	0	0	1
13-Jul	255	1,796*	12,057	83,482	0	0	0	0	0
14-Jul	197	1,993	11,537	95,019*	1	0	1	0	0
15-Jul	125	2,118	9,813	104,832	0	0	0	0	1
16-Jul	208	2,326	9,981	114,813	1	1	1	0	1
17-Jul	86	2,412*	8,076	122,889	0	0	0	0	2
18-Jul	179	2,591	9,758	132,647*	2	0	0	0	2
19-Jul	58	2,649	7,031	139,678	2	0	0	0	0
20-Jul	47	2,696	5,716	145,394	6	0	1	0	1
21-Jul	130	2,826	5,324	150,718	4	0	0	0	0
22-Jul	80	2,906	4,490	155,208	9	0	0	0	0
23-Jul	58	2,964	4,285	159,493	11	0	0	0	0
24-Jul	21	2,985	3,776	163,269	4	0	0	0	1
25-Jul	24	3,009	2,571	165,840	2	0	0	0	1
26-Jul	30	3,039	2,112	167,952	3	0	0	0	1
27-Jul	16	3,055	1,460	169,412	5	0	0	0	0
28-Jul	23	3,078	1,141	170,553	3	0	0	0	1
29-Jul	8	3,086	779	171,332	5	0	0	0	0
30-Jul	12	3,098	575	171,907	0	1	0	0	0
31-Jul	13	3,111	352	172,259	1	0	0	0	0
Total	3,111		172,259		60	13	8	8	23

Table 2. Age and sex ratios estimates by stratum of Chinook salmon sampled at Gisasa River weir, Alaska, 2005. Standard errors are in parentheses. Season totals are calculated from weighted strata totals. Unknown age data indicate numbers of fish that could not be aged from the scales sampled. These were not included in sex ratio, age distribution calculations, or sample size.

					Brood year and age				
					1998	1999	1999	2000	2001
Strata	Run size (N)	Sample size (n)	Unknown age	Percent female	1.5	1.4	2.3	1.3	1.2
Jun 29 - Jul 9	1,026	157	3	35 (3.8)	0% (0.0)	11% (2.5)	0% (0.0)	54% (4.0)	36% (3.8)
Jul 10- Jul 16	1,300	155	5	28 (3.6)	1% (0.6)	16% (3.0)	1% (0.6)	54% (4.0)	29% (3.7)
Jul 17 - Jul 23	638	155	5	38 (3.9)	1% (0.6)	19% (3.2)	0% (0.0)	57% (4.0)	23% (3.4)
Jul 24 - Jul 31	147	124	8	46 (4.5)	0% (0.0)	15% (3.2)	0% (0.0)	65% (4.3)	19% (3.6)
Total	3,111	591	21	33 (2.1)	0.3% (0.2)	15% (1.5)	0.2% (0.2)	57% (2.0)	27% (1.8)
Female	1,039	215	9		1% (0.7)	33% (3.2)	0.5% (0.5)	56% (3.4)	10% (2.0)
Male	2,072	376	12		0% (0.0)	6% (1.2)	0% (0.0)	57% (2.6)	37% (2.5)

Table 3. Length at age of female and male Chinook and chum salmon sampled at Gisasa River weir, Alaska, 2005.

	Female					Male				
		Mid-eye to fork length (mm)					Mid-eye to fork length (mm)			
Age	N	Mean	Median	SE	Range	N	Mean	Median	SE	Range
Chinook salmon										
1.2	21	554	560	9.8	440-625	140	551	550	4.1	420-680
1.3	121	758	760	5.3	656-870	215	725	735	4.1	535-850
2.3	1	860	-	-	-	0	-	-	-	-
1.4	70	820	810	6.5	680-965	21	780	780	11.9	670-890
1.5	2	853	853	27.5	825-880	0	-	-	-	-
Total	215	760	775	6.3	440-965	376	663	693	5.3	420-890
Chum salmon										
0.3	288	547	550	1.7	470-615	320	577	580	1.7	445-655
0.4	4	544	543	17	510-580	7	579	590	12.1	525-615
Total	292	547	550	1.6	470-615	327	577	580	1.7	445-655

Table 4. Age and sex ratios estimates by stratum of chum salmon sampled at Gisasa River weir, Alaska, 2005. Standard errors are in parentheses. Season totals are calculated from weighted strata totals. Unknown age data indicate numbers of fish that could not be aged from the scales sampled. These were not included in sex ratio, age distribution calculations, or sample size.

					Brood year and age	
					2000	2001
Strata	Run size (N)	Sample size (n)	Unknown age	Percent female	0.4	0.3
Jun 29 - Jul 9	51,741	146	14	39 (4.1)	3% (1.4)	97% (1.4)
Jul 10 - Jul 16	63,072	138	22	45 (4.2)	1% (1.0)	99% (1.0)
Jul 17 - Jul 23	44,680	147	13	51 (4.1)	1% (1.0)	99% (1.0)
Jul 24 - Jul 31	12,766	188	12	52 (3.7)	2% (0.9)	98% (0.9)
Total	172,259	619	61	45 (2.3)	2% (0.5)	98% (0.5)
Female	77,987	292	22		1% (0.7)	99% (0.7)
Male	94,272	327	39		2% (0.8)	98% (0.8)

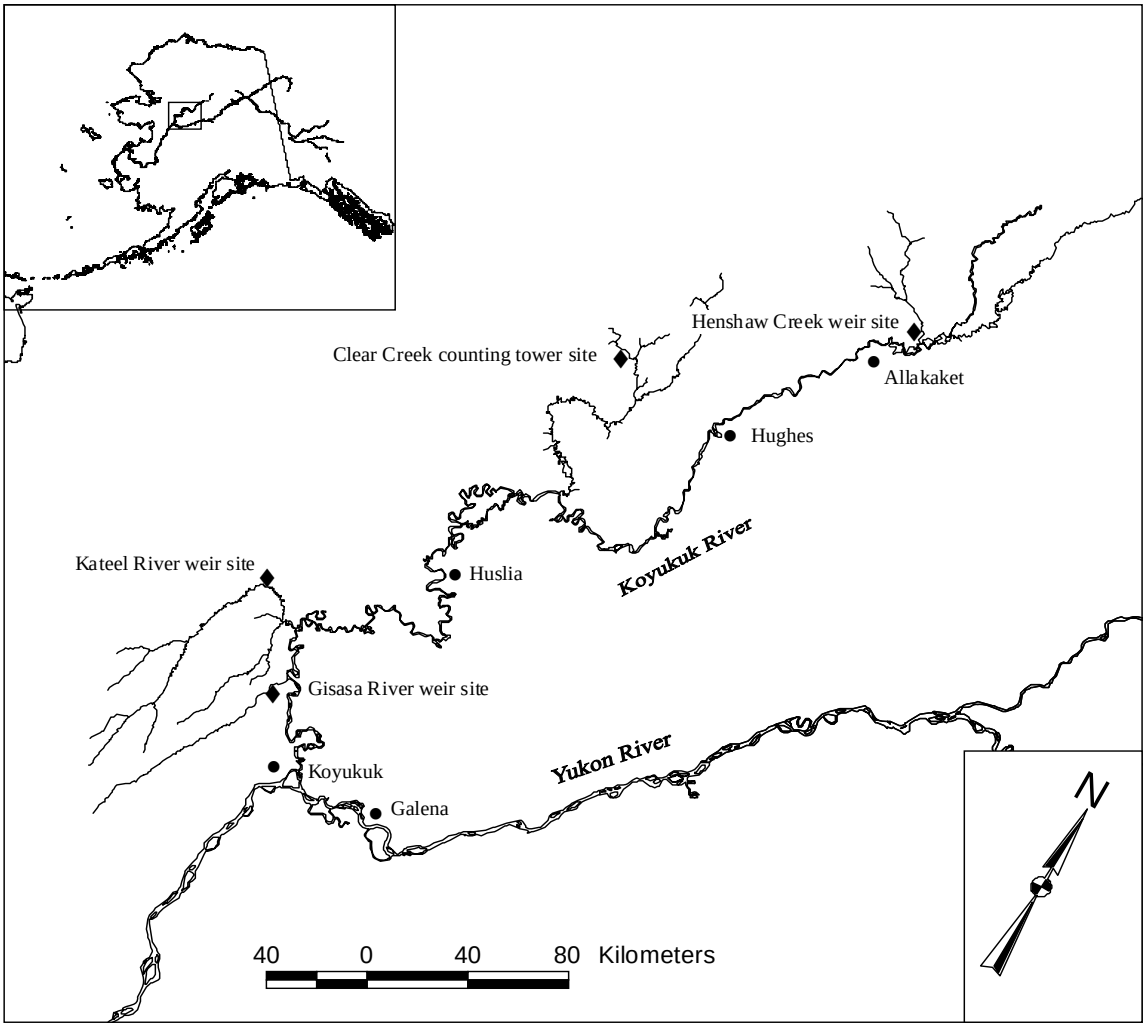

Figure 1. The Koyukuk River and tributary escapement study sites (♦), Alaska, 2005.

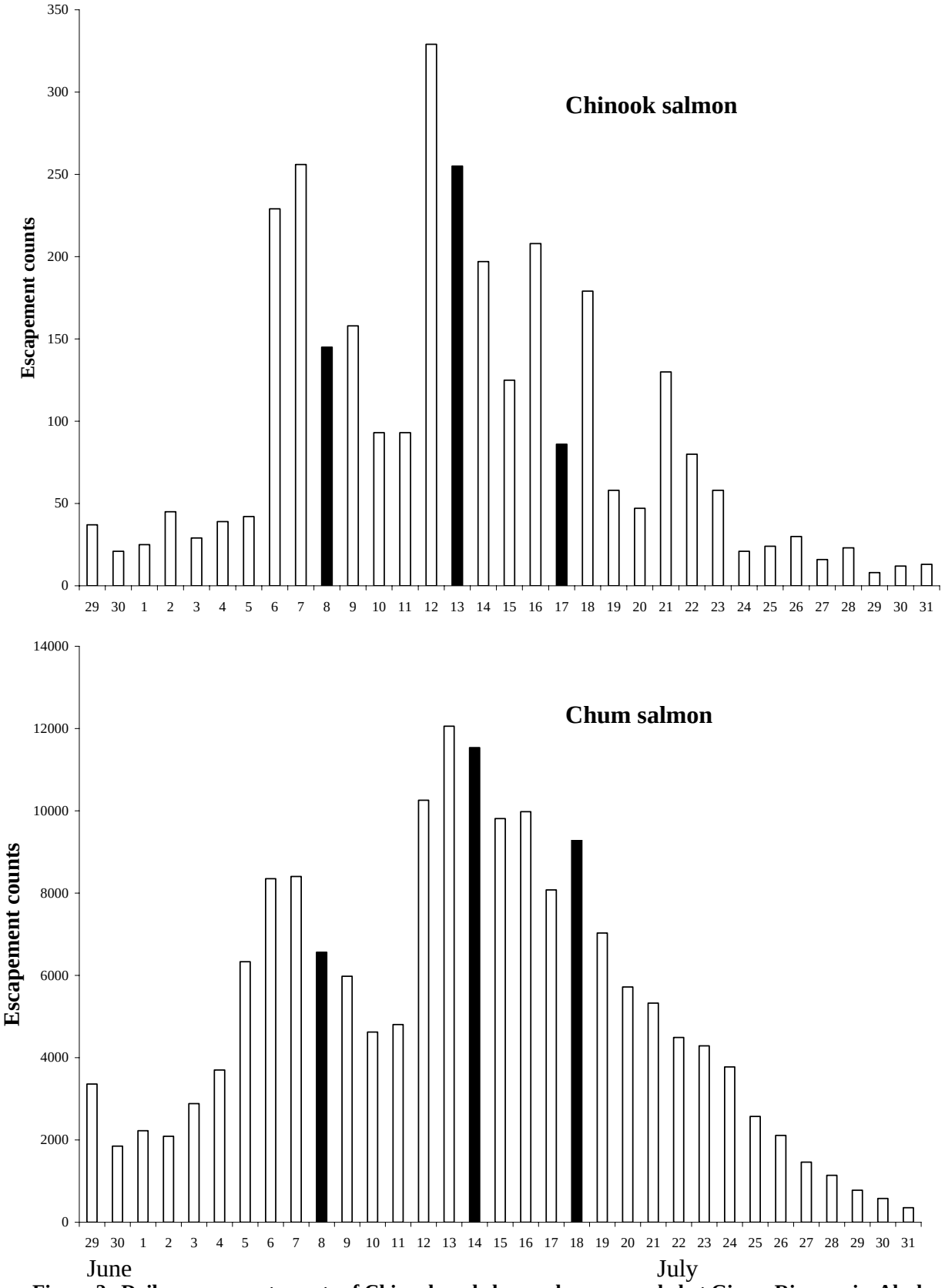

Figure 2. Daily escapement counts of Chinook and chum salmon recorded at Gisasa River weir, Alaska, 2005. Shaded areas represent first, middle, and third quartile of run.

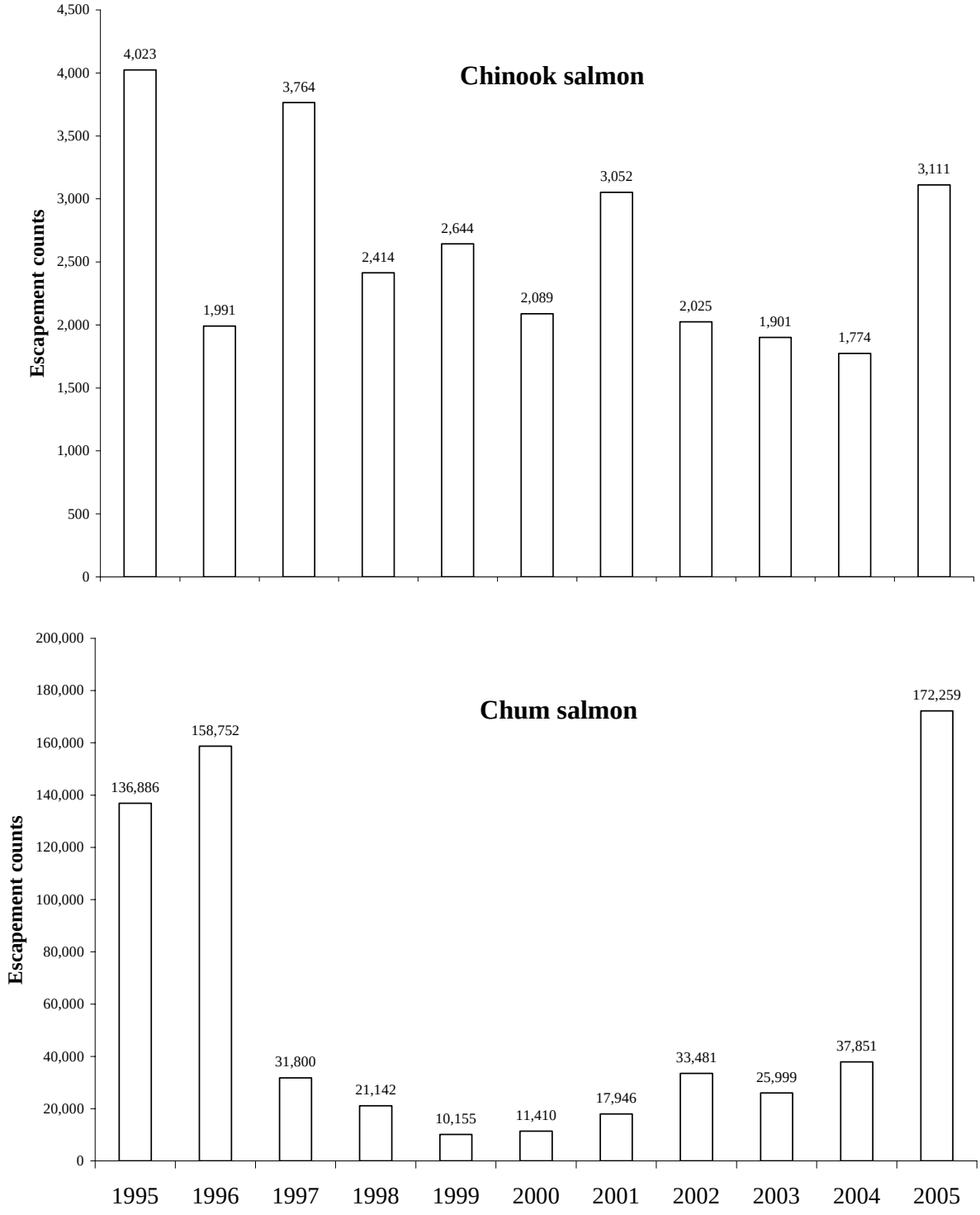

Figure 3. Chinook and chum salmon escapement counts recorded at Gisasa River weir, Alaska, 1995-2005

Appendix 1. Historical Chinook and chum salmon escapements for Gisasa River, Alaska, 1960-2005. All data except weir estimates are from Barton (1984) and ADF&G, unpublished data. Aerial index estimates are surveys that are rated as poor, fair, or good. Ratings are based on a combination of various environmental conditions such as wind, weather, water, visibility, bottom, time, distance surveyed, and spawning time. Years with no data are left out. *indicates partial weir count in 1994.

	Aerial index estimates			Weir estimates	
Year	Chinook salmon	chum salmon	Rating	Chinook salmon	chum salmon
1960	300	400	Good		
1961	266	0	Good		
1974	161	22,022	Good		
1975	385	56,904	Good		
1976	332	21,342	Good		
1977	255	2,204	Good		
1978	45	9,280	Good		
1979	484	10,962	Good		
1980	951	10,388	Good		
1982	421	334	Good		
1983	572	2,356	Good		
1985	735	13,232	Good		
1986	1,346	12,114	Good		
1987	731	2,123	Good		
1988	797	9,284	Good		
1990	884	450	Good		
1991	1,690	7,003	Good		
1992	910	9,300	Good		
1993	1,573	1,581	Good		
1994	2,775	6,827	Good	2,888*	51,116*
1995	410	6,458	Good	4,023	136,886
1996				1,991	158,752
1997	144	686	Good	3,764	31,800
1998	889		Poor	2,414	21,142
1999				2,644	10,155
2000				2,089	11,410
2001				3,052	17,946
2002				2,025	33,481
2003				1,901	25,999
2004				1,774	37,851
2005				3,111	172,259